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SCIENCE NEWS-LETTER

The Weekly Summary of Current Science

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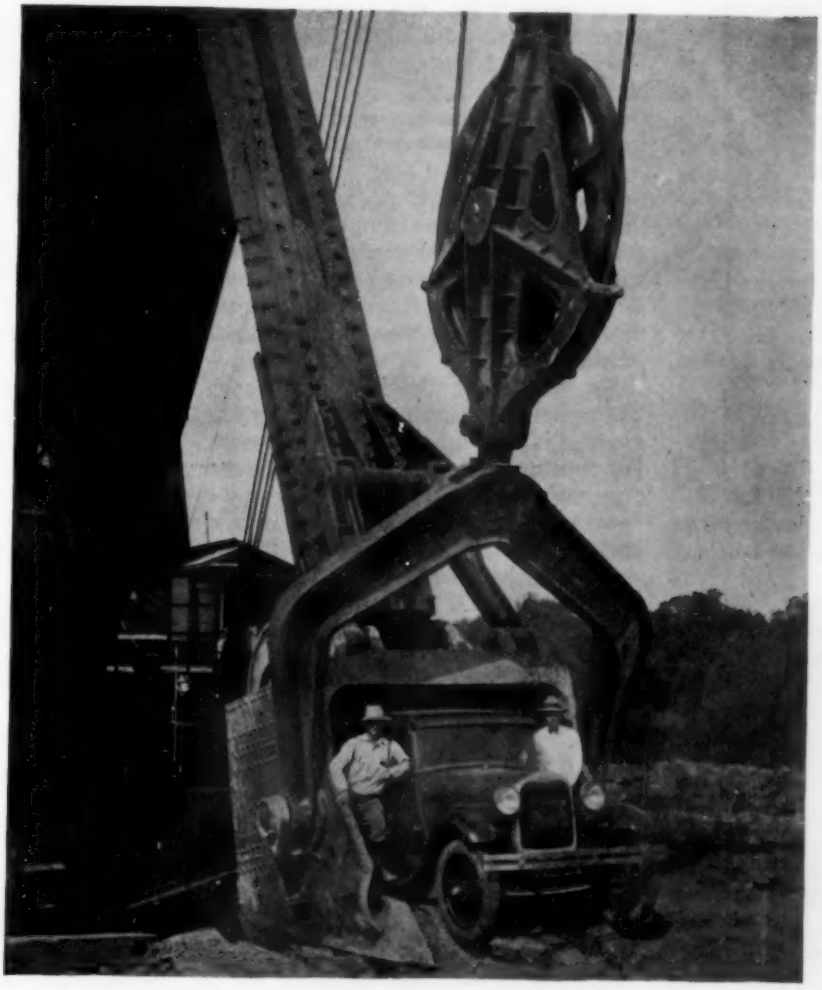

A MAMMOTH AMONG EXCAVATORS

This Shovel Which Can Lift An Auto Is Probably World's Largest

(See page 43)

Vol. XVII No. 458

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Parrot Fever Not Transmitted By Birds Confined To Zoos

Public Health

YOU need not be afraid to visit the zoo for fear of getting parrot fever, or psittacosis. This strange and rare disease of birds and man has seldom been known to affect the parrots kept in zoos. Even if it did, you would be in no danger of contracting it from the bright-feathered creatures in their cages at the zoo or your favorite pet shop.

The only cases of this rare and highly fatal malady have been reported among pets in homes or shops. The only human cases have occurred as a result of intimate contact with infected birds.

Many people who keep parrots and other birds make a custom of feeding their pets from their own mouths. The histories of cases of psittacosis in human beings all show that the sick parrot had been handled and fondled by the persons who subsequently became ill. In a case reported in England, the bird's mistress, in order to keep her sick pet warm, allowed it to sleep under a woolen jacket against her breast.

However, no danger of infection seems to exist unless there is this direct contact. Consequently, Dr. William M. Mann, director of the National Zoological Park in Washington, said it has not been considered necessary to close the parrot room to visitors, even though several cases of psittacosis have been reported in nearby Annapolis. Dr. Mann added that the disease had never occurred among the parrots of this zoo, where it would surely have been detected, as postmortem examinations are made of all the birds that die there.

For some fifteen years psittacosis has been unknown in Philadelphia zoological gardens, according to Dr. Herbert Fox of Philadelphia, leading authority on bird diseases. Scientists are not agreed as to the exact germ causing the disease. There seems to be considerable evidence that it is the Bacillus psittacosis. Some authorities think the unsanitary conditions under which birds are kept on the journey up from the tropics may have some relation to the development of the disease.

So far it has not been a serious enough menace to warrant placing quarantine restrictions upon parrots. There is a considerable profit in the sale of these birds.

There were 68,000 parrots brought into the country during the last year.

When human beings contract psittacosis, they have the symptoms of pneumonia and also of typhoid fever. They suffer from extreme weakness, high fever, a cough, nausea and intestinal disturbances. The disease is fatal in 35 to 40 per cent. of the cases. Some authorities think that the patients actually have pneumonia, that the parrot fever has simply weakened their resistance and made them more susceptible to pneumonia. The disease in the parrots is confined to the digestive system, but in man it is localized in the lungs.

An English authority, Dr. A. P. Thompson of Birmingham, thinks the disease is perhaps not so very rare, but that a number of cases of it may occur which are considered to be some form of pneumonia or typhoid fever, particularly if the fact of a sick parrot in the household is not known to the physician. This was almost true of one case which Dr. Thompson attended. He was kept from a mistaken diagnosis in this case by the insistence of the patient's niece that her aunt had what the parrot had had.

The first case of psittacosis was reported from Germany in 1879. An epidemic of the disease occurred in Paris in 1892, at which time parrots had been very fashionable pets. Since then cases have occurred at intervals particularly in Italy, France and Germany, with only a few in England and the United States. During the last year, reports of cases have been more frequent in Europe and South America. An outbreak is now reported from Germany.

So little is known of the disease that public health authorities are unable to tell whether the three cases in Annapolis are the forerunner of a more wide-spread outbreak or whether they are simply an isolated occurrence. Infection from man to man is not known to occur, so there is little likelihood of anyone getting the disease who has not been in direct contact with a sick bird. However, excreta and even feathers have been found to carry the germ, so that contact with the cage as well as the bird is dangerous, if the parrot is suffering from psittacosis.

The present outbreak of psittacosis or parrot fever in this country has, so far as known, no connection with the one reported in Buenos Aires, Argentina, last fall, Dr. T. S. Palmer of the U. S. Bureau of Biological Survey, has discovered.

No commercial shipments of parrots have been imported from the Argentine since last July, so there is no likelihood that the outbreak here has any connection with that in which a number of actors in Buenos Aires died of the disease contracted from a parrot kept by the star of the troupe.

Some of the parrots that have caused the present outbreak in this country were probably imported from Cartagena, Colombia. They probably are one of the species commonly known as Amazon parrots. The Cuban species of parrot seems also to be involved in the out- (*Turn to page* 46)

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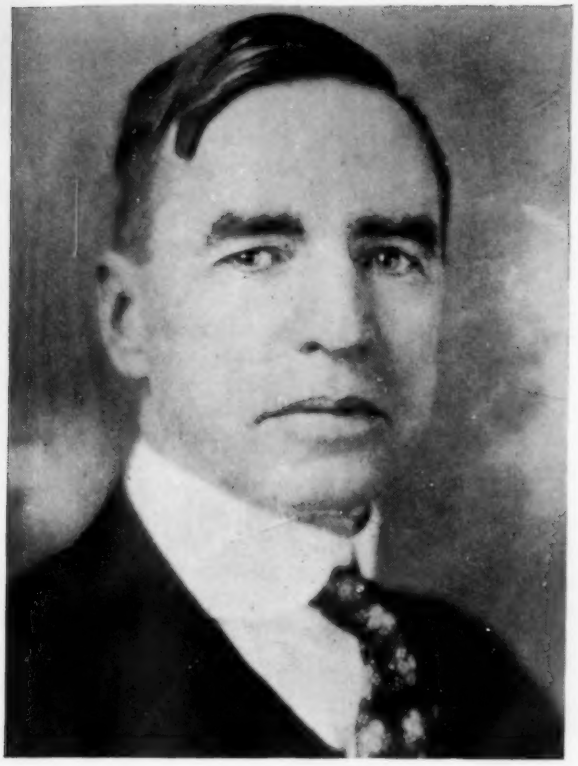

Carbon Monoxide May Now Be Removed From Auto Exhaust

Engineering

Dr. J. C. W. Frazer, chairman of department of chemistry, Johns Hopkins University, who has devised a method for eliminating the deadly menace of carbon monoxide in exhaust gases.

A CHEMICAL device to replace mufflers on automobiles that will eliminate the deadly carbon monoxide contained in the exhaust gases has been developed by Dr. J. C. W. Frazer, professor and chairman of the department of chemistry at Johns Hopkins University.

Since carbon monoxide, odorless, colorless, tasteless and poisonous swiftly in small concentrations, claims many lives each month through the carelessness of automobilists failing to open garage doors before warming up their engines, this latest chemical achievement is hailed as an important step in making the machine age less dangerous.

Dr. Frazer declared today that an automobile equipped with the new oxidizing device could be run in a closed garage without danger from carbon monoxide poisoning.

Because of patent claims, Dr. Frazer has not yet revealed the exact nature of the material that transforms the deadly carbon monoxide to carbon dioxide, the same gas that human beings breathe out of their lungs. But it is known that it is a catalyst, a substance that causes a chemical reaction without itself participating. It is similar in action to the catalyst, consisting of manganese dioxide and copper oxide, that was an outgrowth of chemical warfare work by Dr. Frazer and a laboratory staff during the World War. Fire departments and mine rescue squads use gas masks today that rely on this wartime catalyst for purifying the air of carbon monoxide.

For a year and a half, Dr. Frazer worked to develop the new catalyst that will add oxygen to carbon monoxide even when in direct contact with hot, moist gases. Laboratory tests and thousands of miles of road testing convince him that a canister of the catalyst substituted for a regulation muffler will not only deaden the noise of the engine explosions but remove all the unburned fuel gases in the exhaust, the ill-smelling ones as well as the deadly carbon monoxide. Tests have also been conducted in confined spaces simulating closed garages. Dr. Frazer says the catalyst has been found effective in all these tests, and that there is no doubt that a possible means has been found to eliminate a cause of fatal accidents as well as a source of discomfort and impaired vitality of those who are compelled to breathe atmosphere polluted by gas engine exhausts.

The catalyst produced has worked effectively under all possible operating conditions when properly controlled, it is stated. The adaptation of the discovery to practical automobile use requires only the perfection of a simple, efficient mechanical device to carry the catalyst in such manner that the exhaust gases may be exposed to its action. A satisfactory attachment will require no attention on the part of the operator of the vehicle on which it is installed. That, Dr. Frazer says, is a problem which from present indications can be solved. It is now in the hands of experts who have already produced a reliable device but one which must be further simplified.

As about a third of the fuel is unconsumed in the engine cylinders, the small canister of catalyst has the task of burning half as much fuel as the engine does. Heat from this reaction may be utilized in some way in future installations, such as for car heating or pre-heating the fuel.

At present only one experimental unit of the catalyst muffler is in operation, mounted for convenience on the running board of Dr. Frazer's experimental car. A company for the commercial exploitation of the invention is in the process of organization.

Dr. Frazer, the discoverer of the catalyst, has spent twenty-five years at Johns Hopkins University. He received his degree there in 1901, and remained as research associate until 1907. He then went with the U. S. Government where he was associated with the Bureau of Mines until 1911. He then returnd to Johns Hopkins Univrsity where he has been ever since. He has been Chairman of the Department of Chemistry of the University for many years and is the B. N. Baker Professor of Chemistry.

Science News-Letter, January 18, 1930

The three highest mountains in the world are in India: Mount Everest, Kangchehjunga and Kabru.

Aluminum is being tested as a substitute for tin in the canning of foods in Norway.

The average temperature of streams in northern states has been noticeably raised by the cutting of timber that shaded the streams.

Ancient Ivory Tools Testify To Existence Of Alaskan Culture

Archæology

JUST below the Arctic Circle, on the bleak tundras of northwestern Alaska, flourished one of the New World's oldest and greatest cultures.

Buried under the frozen earth and heaps of accumulations are the remains of an "Ivory Age". Perhaps before or while the Mayas built their cities and temples in Central American jungles, expert craftsmen in these desolate wastes were fashioning tools, weapons and trinkets of exquisite beauty out of walrus tusks.

A leading discoverer of this unique ivory culture is Dr. Ales Hrdlicka, curator of physical anthropology at the National Museum in Washington. He returned recently from Alaska, bringing a large additional collection of the artifacts of this ancient people whose delicate workmanship arouses the enthusiasm of professional anthropologists.

There is nothing else like it in the world, Dr. Hrdlicka says. The first substantial hint of the existence of this culture came in 1926 when the Smithsonian anthropologist visited Alaska in an effort to trace the paths of the ancestors of the Indians and the Eskimos from northern Siberia into North America. Here and there he found finely carved specimens of ivory incised with conventionalized figures and curvilinear designs which had been excavated from the old heaps by the Eskimos.

Where did they come from? They were recognized to represent a culture far superior to that of the present day Eskimos and Indians of Alaska, the craftsmanship of men with artistic ideals and a delicacy of technique far beyond merely utilitarian demands. Dr. Hrdlicka's excavations, matched by those of Diamond Jenness, a Canadian anthropologist of note, led him to conclude that this culture is of considerable age and the work of a highly intellectual people.

Another member of the National Museum staff, Henry B. Collins, Jr., entered the Alaskan field in 1928 and followed Dr. Hrdlicka's route to the Bering Sea. Working at St. Lawrence Island that summer and again in 1929, Collins excavated frozen refuse heaps where prehistoric men had lived and dug out of the earth many specimens of the ancient carved ivory.

Returning last summer Dr. Hrdlicka was able to secure hundreds of new specimens of the fossil ivory culture, all in a good state of preservation, which represent almost fully the mechanical arts of these people. For years it was learned, objects of this kind had been unearthed by the natives and sold to dealers as old ivory, to be used in the jewelry trade, with no suspicion of their scientific value.

As now arranged at the National Museum the objects suggest the array of polished steel instruments in a surgeon's office. There are numerous styles of very beautiful axes, picks, awls, drills, needles, daggers, gouges, scrapers, with which the ancient workmen plied their trades. There are also many adzes, wedges and objects the use of which is uncertain. All are most dexterously designed as tools.

The axes and similar instruments are balanced and "hefted" correctly, in itself evidence of a high culture level. Some of the adzes were fashioned from ivory sledge runners. Evidently ivory was valued material, to be used over and over again.

Beyond this nothing is known for certain about the vanished people. Their bones and the remains of their habitations, if anything remains, are buried far under the frozen sands and have not yet been discovered. The physical geography of the region has changed and obliterated all traces of the ancient habitations as well as burials. Consequently nobody knows

where to dig for them and some fortunate discovery must be made before it will be practicable to excavate. Northwestern Alaska is not a field where scientists can dig at random in the mere hope of finding something.

But the carved ivory pieces themselves, Dr. Hrdlicka says, furnish clues for reconstructing a startling picture of ancient days in the Far North when the human race was establishing its footholds on the American continent. The climate probably has not changed materially. It is now cold and stormy with short summers and long, cruel winters. The landscape is dreary and unstimulating. This is the sort of environment in which one would not expect to find a high culture level. Ordinarily under such conditions men have all they can do to keep body and soul together. The most they develop is a purely utilitarian culture evolved to meet the demands of life. Art is the product of kindlier climates where man has leisure, security and plenty.

The very existence of art means that man has mastered his environment. This gives the first clue to the nature of this early people. They must have had both time and conditions for the development of their artistic culture. There must have been an old high stone age civilization somewhere in the Far North. Furthermore, ivory carving is not likely to have been an isolated phenomenon, for artistic cultures do not develop that way. Art is an expression of higher mental activities. It does not exist independently of such social institutions as religion and law, and it affords a fair measure of the development of these.

Consequently it is fair to assume, Dr. Hrdlicka believes, that anthropology stands on the brink of a major discovery and that in the years to come the frozen tundras of the northernmost lands surrounding the Bering Sea with its islands will yield more and more wonders. These artifacts are merely the beginning of the story of this strange, seemingly vanished people.

It is really, Dr. Hrdlicka says, a high polished stone age culture, but instead of stone the workmen used ivory; and because of the very nature of the material their artistry improved. The ivory, imperishable, relatively easy to work, and taking a beautiful polish, was just what was needed for their growing ideals of beauty.

Who were these prehistoric artizans? This question must remain unanswered for the present, although there are some indications which point to their probable origin. First, nothing has been found which shows an evolution of the remarkable culture in that environment. The most exquisitely carved objects are the oldest. But cultures do not drop out of the sky or spring from the earth fully formed. They come only with slow, painful evolution. In this case it is evident that the artistry must have been evolved elsewhere and brought to the Bering Sea region bodily. The one place from which it could have come was northern Asia, just where in the vast territories of northern Asia remains to be determined. It was a coastal as well as land culture. Its presence in the northernmost parts of the Bering Sea is a further strong evidence that this was the path of immigrants into North America, a position Dr. Hrdlicka long has maintained.

The theory has been that native groups in Siberia, pushed farther and farther eastward and northeastward by the pressure of populations and the retreating game, finally came to the ocean and followed this to the end of the land. But on a clear day they might see the outlines of new land over the water. So they came, a comparatively few at a time but over the course of many centuries, if not thousands of years. And they carried their dialects, cultures and institutions with them. The new discoveries indicate that they were far from the crude savages they have been pictured. Quite to the contrary, they probably had achieved one of the richest and finest stone age cultures yet discovered in the world. They established their villages and adapted themselves to the new environment. Then, the artifacts indicate, the culture began to degenerate. The tribulations of the climate were proving too strong, or a less cultured group supervened, until matters became stabilized in the later Eskimo culture of those regions, still fairly rich and able, but paling before the older.

The cold, bleak, barren environment of the northern Bering Sea is not such as to sustain broad and high culture. It declined, and perhaps the people wandered farther away to the southward, gradually peopling the coasts of Alaska and beyond, and carrying with them only a lingering tradition of the culture of their ancestors. From time to time it broke out in new forms as Indian tribes became sheltered and prosperous.

The Eskimos of today have an ivory culture which bears strong evidence of having been inherited from this first great artistic era, but it shows considerable devolution. Life has been too hard for the Eskimos to reach again the level of their predecessors or ancestors. The Eskimo ornamentation, for instance, is distinguished by straight lines, simple geometric designs, and natural (instead of conventionalized) representation of animals, scenes, etc. There are no curved lines. And the difference between an artistic curved line and a plain straight line graven on ivory or stone is a great difference in the eyes of the anthropologist.

The National Museum collection contains also many tools for use in making nets, ornately decorated fish spears, spoons, knives, and kitchen utensils, and purely ceremonial objects ornamented with human or animal figures which show delicate carving and polishing. There are figures of fish and mammals with many conventionalized details.

The precise age of this ivory culture, says Dr. Hrdlicka, cannot be determined from present evidence.

"All we can say," he says, "is that it is very old." It is older than any other human remains found so far in those parts of the New World.

The migrations of the Asiatic people into America must have been very slow, requiring hundreds of generations, to reach the distribution found when white men first came to America. The (*Turn to page* 44)

Tools ornamented with curved lines found in Alaska. The modern Eskimo uses only straight lines. The use of many of these tools is unknown.

Astronomers See Quartz Mirrors Made

Stars Hold Secret of Travel Between Planets

Astronomy

THE other day, for the first time, America's leading astronomers saw the method by which their huge telescopes of the future will be made. After a two-day meeting at Harvard University and Wellesley College, members of the American Astronomical Society journeyed to nearby Lynn, where Dr. Elihu Thomson, director of the General Electric Company's Thomson Research Laboratory, showed the preliminary work on quartz mirrors like those that will be used in the 200-inch telescope in California. The astronomers saw how a 3000-degree "sleet storm" deposits a layer of crystal clear quartz on a disc of opaque quartz. In such a layer the curves required for the telescope mirrors can be ground with even more ease than in the glass mirrors that are used today.

The difficulty with glass is that its size alters rapidly with temperature, but with quartz there is practically no change. Take a stick of quartz a yard long, raise its temperature 1800 degrees Fahrenheit and it lengthens about a fiftieth of an inch, far less than would glass.

This property makes it especially suitable for telescope mirrors, said Dr. Thomson, who is himself an astronomer as well as a physicist. Telescope mirrors are ground to the required dish-shaped curve by rubbing with another glass. The mirror is heated by friction and the edge warms up more than the center. This temperature change causes it to expand, and when it cools the edge is too low. Therefore, in grinding a glass mirror, it is necessary to grind a little, then wait for it to return to normal temperature and then grind some more. But with quartz, Dr. Thomson explained, the grinding can be carried right through to the finish. Even though it is harder than glass, he said, it is no harder to grind. For such reasons as these, and also for advantages that quartz has in actual use, astronomers connected with the California Institute of Technology have decided that the 200-inch telescope now under construction at Pasadena will have a mirror of quartz. Scientists at the Lynn Laboratory are working on the blank from which the mirror will be made.

Until a year or so ago no discs of quartz of the requisite clarity had been made larger than a few inches in diameter. After many trials, with varying degrees of success, a satisfactory method was invented of successfully preparing the disc. A disc of white quartz is made which is too rough to take the polishing and silvering required for a satisfactory mirror. On this is sprayed melted quartz, and a layer as deep as desired consisting of smooth, transparent quartz is quickly formed.

This was the method that the astronomers saw demonstrated. Looking through special masks that gave the eyes protection from the brilliant glare of the flame, even though the intense heat made it impossible to watch for very long at a time, they saw a 3000 degree flame of hydrogen and oxygen deposit quartz at the rate of several pounds an hour. Above the tubes carrying the hydrogen to the flame were chambers containing finely ground quartz flour. This was sucked into the stream of gas like a medicinal solution into an atomizer, and was carried to the flame, burning with intense heat. Here the quartz was melted, but when it reached the cooler rough disc, at only a thousand degrees, it froze solid. Exactly the same thing takes place in nature during a sleet storm. Rain falls on trees and other objects, cooled below the freezing point of water, and a layer of clear ice is the result.

The astronomers saw a complete telescope mirror disc, with a top layer of clear quartz an inch thick. The disc was twenty-two inches in diameter, which is the largest size that has yet been made. But they were told that the present limit of size was found in the furnaces in which the rough bottom disc is made. The largest furnaces now available will just take so large a disc, but one is being constructed to make a rough disc 60 inches in diameter. Then one 100 inches in diameter will be made, and then the 200-inch disc itself will be tackled.

To the astronomers who saw the demonstration, it appeared that the 3000 degree sleet storm would be able to coat a disc of any size, so there seems to be little doubt that the 200-inch mirror will be made when the technical details are solved. It is still very uncertain when this will be completed. But the scientists in charge expect to have the 60-inch disc ready during the coming autumn.

Interplanetary Travel

IN the stars themselves is locked one of the secrets of successful travel between planets by means of rockets. Only with fuels that will yield amounts of energy approaching that of stellar material can we ever hope to get away from the gravitational attraction of the earth taking any useful load along, the astronomers were told by Dr. John Q. Stewart, of Princeton University.

In attaining the momentum needed to operate a rocket, in which motion is obtained by shooting stuff backwards, it is necessary, either to shoot a low mass at a high speed, or a heavy mass at low speed. If the latter course is decided on, the substance of the rocket is rapidly used up. On the other hand, if a relatively small amount of material is used, and it is ejected at high speed, large amounts of energy are needed, and this is also limited, said Dr. Stewart.

In order to fire a projectile from a gun so that it will leave the gravitational attraction of the earth and reach outer space, it must be fired at a speed of at least 7 miles a second. Similarly, said Dr. Stewart, the stuff from a rocket must be fired back with some such speed, if the rocket is to get away from the earth with any appreciable fraction of its original mass left. At a speed of a mile a second, which is the fastest that has been attained with long range guns, less than a thousandth part of the original mass would be left. Thus, for a rocket to carry 500 pounds of flash powder to the moon, as one rocket experimenter has suggested in order that terrestrial astronomers might see the results of the arrival, the rocket would have to weigh many hundreds of tons at the start.

The answer to this problem lies in the use of fuels that will take the rocket out at a speed of 7 miles a second or greater. Dr. Stewart has calculated that a fuel with the unprecedented efficiency of 15 kilowatt hours per pound would be required.

Ordinary coal contains about a tenth as much energy as this.

Ionized hydrogen, in which the atoms have been partly broken could theoretically be used, he said, for this contains about 150 kilowatt hours per pound, even though there seems no possible way of using it.

It is in the stars themselves that one solution lies, declared Dr. Stewart. Astronomers believe that the energy which keeps the stars going comes from the distintegration and disappearance of the atoms of matter. A pound of matter thus annihilated would yield billions of kilowatt hours.

With our present knowledge of sources of energy, Dr. Stewart's figures make any really successful rocket communication with other planets seem very difficult. But the case is different if the idea is merely to reach the upper layers of the atmosphere, higher than any available with balloons or airplanes. A speed of a mile a second might take a rocket to an altitude of a hundred miles, he said, and still carry a useful load of instruments or cameras.

Extent of the Universe

THE size of our universe, and how it is put together, were two of the chief problems to engage the astronomers' attention. Discussing the extent of the universe, Dr. Knut Lundmark, eminent Swedish astronomer, now visiting the United States, told his American colleagues that the size of the universe is at least two hundred million light years. Even though a beam of light travels fast enough to cross the continent from New York to San Francisco in a seventy-fifth of a second, two hundred million years are required for the light to reach us from the most distant objects that come within reach of the astronomers' telescopes.

These vastly distant objects were termed by Dr. Lundmark the anagalactic nebulae. They include the spiral nebulae that have been studied in recent years with the great 100-inch telescope at Mount Wilson Observatory in California and identified as huge swarms of stars. All the stars that we can see, either with the unaided eye or even with most of the present-day telescopes, form a somewhat similar system of stars, except that our own galactic system is far larger than any of those we see beyond its limits.

Dr. Lundmark expressed himself in agreement with a theory proposed by Dr. Harlow Shapley, Director of the Harvard Observatory, that our own system is made up of a number of smaller units, each similar to the outer nebulae. Dr. Shapley has studied a loose swarm of these objects, known as the Coma-Virgo cluster, from the constellations in which it is seen. If such a system were to be compressed, the separate nebulae and clusters would amalgamate and the result would be similar to the system in which we live. This, he believes, gives a clue to the evolution of our galaxy.

Support of this theory is found in the fact that the galaxy contains a number of smaller clusters, one of which includes the sun. These, in Dr. Shapley's opinion, represent the remnants of the individual members like the objects in the coma-virgo cluster. But to them Dr. Lundmark suggested the addition of still another kind of thing. Scattered through our galaxy are numerous balls of millions of stars, called the globular star clusters. Also, scattered through outer space, are many spherical objects, at the same distances as the spiral nebulae, but differing from them because they show no structure. They are just round balls of light, and are doubtless huge globular clusters, so remote that the largest of telescopes fail to reveal the individual stars of which they consist.

The globular clusters in our home galaxy, Dr. Lundmark believes, are of a similar nature. They, too, are mixed up with the local clusters and other units that form the celestial potpourri in which our sun and solar system is such an insignificant part.

Dr. Shapley also told the astronomers of his latest studies on two of the nearest of these outside stellar swarms, the Magellanic clouds. Visible from the southern hemisphere of the earth, they look like detached pieces of the Milky Way. Previously it has been supposed that they are at distances of about a hundred thousand light years. He now calculates them to be about 16 thousand light years closer, and places them at 86 thousand light years. He also suggested that astronomers may be wrong in supposing them the nearest of the outer systems, for perhaps, he said, they may also be associated with the other things that make up our galaxy, and so be part of our own system. They seem to be moving through space, but when this motion is corrected for the rotation of the galactic system that he has discovered, they prove neither to be receding from, nor approaching us. This suggests that in some way they are associated with us. He also suggested that even the Andromeda nebula, a spiral aggregation of stars nearly a million light years away, may really be associated with our own galaxy more closely than astronomers have supposed.

Science News-Letter, January 18, 1930

Dr. Elihu Thomson (right) director of the Thomson Research Laboratory of the General Electric Company, and his associate, Dr. A. L. Ellis, who developed the method of spraying fused quartz in a 3000° "sleet storm." They are shown displaying the 22 inch mirror, the largest yet made in this way, to the members of the American Astronomical Society.

Safe Planes

With the presentation of the $100,000 prize of the Guggenheim Safe Aircraft Competition to the Curtiss Tanager, this epochal contest is over. Of nearly thirty entrants only a dozen machines put in an appearance on the field. Of those only two came close to and only one, the winner, met the qualifying conditions.

There were all kinds of aircraft entered from ordinary stock model sport airplanes to the other extreme, the autogyro. The winner and the runner-up were practically stock type ships, modified somewhat with the intelligent application of certain devices which today are not new. Nor were they new nearly three years ago when the requirements of the competition were written.

The victory of the Curtiss Tanager is a victory for Ted Wright and his design staff, who produced the winner, but it is even more a demonstration of the thoroughness of the specifications as laid down by the fund. Much has been heard of the rigidness of those requirements and the impossibility of their being attained. We should not be misled by the results which show but a sole survivor.

Given any reasonable length of time, a hundred airplanes could now be built which could qualify. This does not mean that the Curtiss engineers could not lay out another tomorrow which would walk through the new field of starters.

The object of the competition was to produce a safe airplane, or to put it in a more popular phrase, a fool proof plane. This the Tanager may be for we have seen it put through some literally foolish maneuvers. I feel safe in saying that a man would be safe in it who was no more than deliberately foolish.

The single winner is the only tangible evidence of the success of the competition, yet the lessons taught by the winner and the demonstration that designers can meet rigid specifications for safety will surely tend to make safer our airplanes that are already safe.

Aviation
Science News-Letter, January 18, 1930

Canker Obliterated

There are no trees in the United States now standing with an infection of imported larch canker, so far as the Bureau of Plant Industry now knows.

This does not mean, Dr. William A. Taylor, chief of the Bureau of Plant Industry, stated to the House Appropriations Committee, that there may not be some trees infected which the Bureau has not found, and others exposed and having the disease incubating.

A sum of $35,000 for cleaning up this tree disease was appropriated in the Department of Agriculture Appropriation bill last year, of which only $5,000 has been spent. The Department will go on with the work in 1930-31, under the existing appropriation.

Forestry
Science News-Letter, January 18, 1930

300,000 Words

A new history of the World War is completed and in circulation. This is the U. S. Army's record of the medical work done by physicians, surgeons and nurses. It is called the "Medical History of the World War."

This monumenttal work, Maj. Gen. Wm. M. Ireland, surgeon general of the Army, has told Congress, should prove a most valuable reference book for this generation of physicians and statisticians. It is in 15 volumes, and two of the volumes have two books.

The U. S. Army is still working on its official history of the World War, with prospect that it may not be completed until 1940. Twenty-two officers are working on it, and eight clerks. It is expected to contain 7 to 9 volumes of 200,000 to 300,000 words each.

Medicine—History
Science News-Letter, January 18, 1930

Why Noises Annoy

Why the high notes of a shrill soprano solo are more apt to be received with shudders than the rasping tones of a poor conversational voice is accounted for by two psychologists who have been experimenting with annoying noises.

It is not so much the volume of sound as the pitch that causes noises of this type to affect us like the grating of sand paper against sensitive nerves, these psychologists, Dr. Donald Laird and Kenneth Coye, of Colgate University, believe. The pitches of human speech are the least irritating to us humans. The psychologists speculate as to whether this may be a biological adaptation.

Their experiments, which have been chiefly with acoustical installations, are designed to determine whether devices are needed to protect the ears and nerves of workers when the actual volume of noise about them is not particularly great.

It has been generally believed that high pitches were especially annoying. But whether low pitches were also irritating has been a question. Dr. Laird reports that the high pitches he used were decidedly more annoying than three tones which he describes as "moderately neutral." Low pitched tones were found to be as annoying as high, except that the very highest shrill sounds were the most irritating of all.

If the absolute zero of annoyance can be determined, it will be possible to measure the degrees of annoyance aroused by different degrees of pitch and volume of sound, the psychologists state.

Psychology
Science News-Letter, January 18, 1930

IN VARIOUS SIE

Eye Saved

An unusual case in which a bony tumor was removed from the eye socket without injury to the eye was reported to the Southern Surgical Association by a New Orleans surgeon, Dr. Isidore Cohn. The tumor measured two and one-half inches by one inch. The patient after recovery had full use of the eye without disturbance in any way of the vision, Dr. Cohn stated.

Surgery
Science News-Letter, January 18, 1930

New Plastic

Reduction in the cost of distributing talking movie records to theaters, along with better reproduction of sound, is foreseen as the result of the development of "durium," a new synthetic resin that will make cheap and almost indestructible phonograph records.

While many of the talkie producers record the sound track on the film alongside the picture, from which it is converted back to sound by a photoelectric cell, the flat disc record still finds wide use. One large producer uses such records entirely, while several others produce their films with both kinds of record, leaving it to the theater operator to decide which to use.

With the old heavy disc records, made out of the same material as phonograph records used in the home, but 16 inches in diameter, shipping costs mount rapidly. The records are always sent in duplicate, and, to large theaters, in triplicate, so that breakage of a record will not stop the show. Furthermore, a single record cannot be used more than 10

or 15 times, without having the scratch become too apparent.

The durium records are made by coating the new synthetic resin on heavy paper, and embossing the grooves of the sound track into it. They are light and unbreakable, thus cutting greatly the shipping and packing costs. They will stand all kinds of rough treatment, such as hammering, bending, heating or scratching, without impairing the sound track. They have practically no surface noise, and can be played for a hundred or more times, according to the claims of the inventor.

Dr. Hal. T. Beans, Columbia University chemist, is the inventor of the new resin, the chemical details of which are not yet known because of the patent situation.

Chemistrty—Physics

Science News-Letter, January 18, 1930

Balls of Helium

Six huge balls mounted on a flat car to appear on American railroads soon will not be globes consigned to a mammoth pawn shop, but efficient containers for precious helium to carry the gas from Texas oil fields to distant airship hangars.

When tested recently, one of these six-foot spheres, made of steel an inch and a half thick and mounted on a flat car, was filled with helium at 1,250 pounds per square inch pressure and run off a 25-foot bank. It was unharmed. It finally exploded under a pressure of 4,500 pounds.

The odd-shaped container is used because it can carry twice as much gas as a cylinder of the same volume. That sounds contradictory, but because of its spherical shape, the pressure required in the sphere to stress the steel equally is double that required in the cylinder. Consequently at double pressure the sphere will hold double volume.

Engineering

Science News-Letter, January 18, 1930

Ether Reduces Whoops

Results obtained with a new method of administering ether in cases of whooping cough were described by Dr. W. Ambrose McGee of Richmond at a meeting of the Southern Medical Association. Ether has an antispasmodic action which physicians are trying to use to lessen the intensity of the paroxysms of whooping cough and also to shorten the duration of the disease.

While some scientists have tried hypodermic injections of the ether into the muscles, Dr. McGee has had considerable success with another method of injection by which the drug is absorbed directly from the intestinal tract. This new method of treatment is not a specific cure, but Dr. McGee found it more effective in relieving the symptoms of the disease than other methods of treatment now commonly used. By rather literally taking the whoop out of whooping cough, the small patient is kept from becoming so exhausted and therefore he can recover from the disease more quickly.

The ether injections gave more consistently satisfactory results than the various whooping cough vaccines, Dr. McGee reported. He also stated that this treatment is more successful the earlier in the disease it is started. For this reason he stressed the importance of early diagnosis of whooping cough and declared that a simple blood test combined with other examinations make it comparatively easy to arrive at the desired early diagnosis.

Medicine

Science News-Letter, January 18, 1930

Winter Range

Extension of their winter range, eliminating as much as possible the crowding and concentration incident to feeding with hay, is one of the keys to the promotion of good health in the great elk herd of Jackson Hole, south of Yellowstone National Park. This was brought out by O. J. Murie of the U. S. Biological Survey, who has spent something over two years following the herd and learning their ways and life problems. The Commission consists of representatives of U. S. Government departments, the state of Wyoming, various wild life organizations, and business men.

It is necessary to feed hay to the elk comparatively early in the winter under present conditions, Mr. Murie explained, because if this is not done the animals crowd upon the ranches in the valley, stealing hay intended for the farmers' livestock and in general raising a disturbance. This prolongs the period of their crowding together on the elk feeding grounds, and crowded elk interchange disease germs just as crowded human beings do. If some or all of the ranch lands can be acquired and turned into elk range, the elk can be left to shift for themselves farther into the winter, keeping them uncrowded and in better condition than they are at present.

Zoology

Science News-Letter, January 18, 1930

Fewer T. B. Deaths

"The time is not far distant when a new major decline in tuberculosis may again take place," statisticians of the Metropolitan Life Insurance Co. have just declared. Their earlier prophecy that 1929 would see the lowest tuberculosis death rate ever recorded in the United States will certainly be fulfilled, they found after a review of the latest figures.

Reports through the end of November, the latest available, showed a rate of 85.9 per 100,000, which is a decline of 5.7 per cent, as compared with the corresponding period of 1928. Tuberculosis will some day rank among the relatively minor causes of death. A death-rate of 40 per 100,000 will probably be approached during the next ten years.

"The greatest reduction in the mortality from tuberculosis has taken place in that group of the population where the situation has always been the gravest," the statisticians pointed out, referring to the group of wage earners and their families.

"With the attainment of a death-rate of 40 per 100,000 we shall have reached the point where the end of the fight against tuberculosis will surely be in sight," they stated.

Medicine

Science News-Letter, January 18, 1930

Sky Glow

Seen on any clear moonless evening after twilight as a faint beam of light in the western sky, the zodiacal light has long been an object of study by astronomers and physicists. At the meeting of the American Physical Society, Dr. E. O. Hulburt, of the U. S. Navy's research laboratory, suggested its connection with magnetic storms that sometimes affect the earth.

Recalling observations made 75 years ago by a navy chaplain, Rev. George Jones, Dr. Hulburt pointed out that most abnormalities of the zodiacal light, such as fluctuations, unusual brilliance or distribution over the heavens, followed magnetic storms. This, he thinks, indicates some connection, and suggests that the particles which cause the zodiacal light, by scattering light from the sun in some manner, originate in the atmosphere of the earth. The partly broken atoms high in the atmosphere may cause the phenomenon under the combined effect of the pressure of sunlight, the gravitation and magnetism of the earth.

Meteorology

Science News-Letter, January 18, 1930

Exploring a Particle Now Possible

Chemistry—Physics

Photo-Electric Device Reveals Minute Composition

A NEW discovery, of value to scientific research and to industry—the chemical analysis of particles so small that hitherto they defied all attempts to determine their composition—has been explained by Dr. W. C. MacTavish, professor of chemistry at New York University. The analyses were made by two young Austrian chemists now connected with New York University—Dr. Anton Benedetti-Pichler and Dr. Joseph Niederl, both of them former students of Prof. Fritz Pregl, who received the Nobel Prize for his work in microanalysis. Both come from the Chemical Institute of the Technical High School at Graz, Austria.

Dr. Niederl demonstrated a method of analysis discovered by one of his pupils at New York University, William Saschek. He termed it the "micro-vaporimetric molecular weight method of analysis," by which he determined the composition of a fraction of a drop of liquid.

Then Dr. Niederl explained that there are as yet only three other laboratories equipped to do micro-analysis—that of the Rockefeller Institute, where he helped install the apparatus, and the laboratories of Columbia and Johns Hopkins Universities.

Illustrating the value of the method, Dr. Niederl explained that he recently had determined for one of the leading New York laboratories the chemical constituents of a small drop of substance produced in an effort to find a rubber substitute and that upon another occasion Dr. Pichler had determined microscopic impurities in iron that was being galvanized. The method may be used in determining the genuineness of old paintings and coins, he said.

In demonstrating the micro-vaporimetric molecular weight method, Dr. Niederl analyzed about a third of a drop of liquid contained in a capillary tube. The tube was placed in mercury and then broken, releasing the liquid. The mercury was then heated until the liquid from the tube became gas. As the gas expanded it forced off an amount of mercury equal to its volume. By taking into consideration the temperature at which the gas was vaporized, together with its volume, its molecular weight was determined. Dr. Niederl said a method of analyzing mixed substances was now being developed.

Dr. MacTavish also demonstrated an automatic chemist that uses an electric eye to keep the analysis under control. The device is fairly simple. A beam of light is cast through the liquid being analyzed so that it falls upon a photo-electric cell. Above the beaker containing the liquid under investigation is a tube which passes an acid drop by drop into the beaker. A small amount of chemical indicator added to the liquid in the beaker makes the liquid red, so that the beam of light passing through it is not powerful enough to operate the relays connected with the photo-electric cell.

When a sufficient amount of acid has dropped into the beaker the red color disappears, indicating complete neutralization. This allows enough light to pass through the liquid to operate the relays and give the chemist a signal that his test has been completed.

"Using a robot of this kind around a chemical laboratory will save a great deal of the chemist's time," Dr. MacTavish said. "Its electric eye is ten times as sensitive as the human eye and will distinguish shades of color impossible to the chemist."

A colleague of Dr. MacTavish, Dr. H. M. Partridge, has perfected a method of producing lithium in such quantity as to make it commercially available at low cost. Although it formerly cost $20 an ounce, it now was produced for $20 a pound, he said. He has prepared one piece about the size and shape of a baker's jelly roll, which is probably one of the largest pieces ever made. The metal weighs one-fifteenth as much as iron. It is so light it floats in kerosene, having only one-half the specific gravity of water.

Finds House 5,000 Years Old at Ur

Archaeology

DIGGING down into the soil of Ur of the Chaldees and digging back at the same time farther into ancient history, the joint expedition of the University of Pennsylvania Museum and the British Museum has found ruins of a house inhabited 5,000 years ago. The expedition, which is now started on its eighth season of excavations at the home town of Abraham, is concentrating this year on learning more about the town of Ur before the flood spread its thick layer of barren mud over the region.

A report just received from C. Leonard Woolley, director of the expedition, states:

"We have now dug some 15 feet over the whole area and already have the ground-plans of five totally distinct buildings superimposed one upon another. Each of these buildings enjoyed a reasonably long life, judging by the repairs to the walls and by the way in which floors have been relaid, and the levels we have now reached must take us back into the early part of the fourth millenium before Christ."

Even the oldest of these houses is not of the pre-flood city, Mr. Woolley reports. That lies deeper.

"But it is the work of a civilization almost as old," he adds, "and these walls, built of small mud bricks laid herring-bone fashion, are the monuments of an era new to Mesopotamian archaeology."

The oldest royal graves at Ur which the expedition has unearthed in previous seasons have been estimated by Mr. Woolley to belong to the time 3200 to 3500 B. C., which is older than the First Dynasty of Ur. Some scientists have been reluctant to accept so early a date. Mr. Woolley reports that he has now, unexpectedly, obtained definite proof of age. The graves were dug into the great rubbish mounds which had risen outside the walls of the prehistoric city. Where he is now working the rubbish is laid in well-defined strata and the mound's growth can be traced in bands of varying color. In one of the highest, most recent layers have been found fragments of clay jar-stoppers stamped with seals, and among these the seals of the first king of the first dynasty of Ur, Nesanni-padda and his wife, Nin-tur-Nin. This stratum of rubbish formed about 3000 B. C. stretches unbroken over the royal graves, and thus demonstrates their greater antiquity, Mr. Woolley points out.

Trees Date Alaskan Glaciation

Geology

Though Far North, Most of Alaska Escaped Ice Age

IN Spite of its far northern latitude, Alaska was at no time completely covered with ice during the Glacial Period, according to Dr. Stephen R. Capps of the United States Geological Survey. Even during the so-called Wisconsin stage of the Pleistocene glaciation, when practically all of Canada and most of the northeastern quarter of the United States was submerged beneath a great ice sheet, scarcely half of Alaska was glaciated. In the south, glaciers filled the valleys and crept down the slopes of the Alaska Range and of the coastal mountains; and a continuous ice front fringed the southern shores of Alaska. Similarly in the north glaciers descended from the slopes of the Brooks Range. But the broad central valley of Alaska, drained by the Yukon and Tanana rivers, was practically untouched by glacial action. Only small local ice streams descended from the few scattered elevations which here and there interrupt the level surface of the central valley.

The age of the principal glaciation in Alaska has been determined rather ingeniously by a study of post-glacial peat beds and of the spruce stumps embedded in them. These stumps are remarkable for having, not one set of roots radiating out horizontally from the trunk as a center, but two or more parallel sets of radiating roots, one above the other. As the peat accumulated about the spruce trees and the line of permanently frozen ground rose higher, the roots of the trees were frozen and the tree was compelled to put forth a second set of roots. By measuring the distance between these sets of roots and counting the rings of annual growth of the trees, it has been possible to determine the length of time that has elapsed since the retreat of the glaciers. These calculations put the date of the principal glaciation in Alaska back from 20,000 to 30,000 years, and make it about contemporaneous with the so-called Wisconsin advance of the ice sheet in northeastern United States.

Transported boulders, scratched and grooved rocks, faceted pebbles, and beds of boulder clay show that Alaska was glaciated at least four times during the Pleistocene period. Traces of these earlier ice invasions, however, have largely been obliterated by the last and principal glaciation, during the Wisconsin stage. The existence of similar beds containing glacial boulders shows that Alaska had an ice age as far back as the Silurian period of the early Paleozoic era; and some geologists believe that several glaciations occurred during the Paleozoic era.

At present, Alaska is believed to be in an interglacial period between two ice invasions. The total time that has passed since the retreat of the "Wisconsin" ice sheet is much less than the time calculated to have elapsed between glaciations during the Pleistocene period.

The effect of glaciation on southern Alaska was not altogether fortunate. Many rich accumulations of gold-bearing gravel were swept away by the advancing glaciers; the present placer deposits are merely the few remnants that somehow escaped destruction. In many places the top soil has been carried away by the ice, and the land spoiled for farming. In other places however the land has been enriched by soil deposited by streams flowing from the melting ice front.

Science News-Letter, January 18, 1930

Huge Shovel Can Lift Car of Coal

Engineering

THE largest shovel in the world, with a scoop big enough to pick up an automobile is the subject of our cover illustration. It is in use at the Fidelity mine of the United Electric Coal Co., near DuQuon, Ill., the greatest coal-stripping enterprise in the world.

Electrically operated, the shovel obtains its power from a cable that trails behind. It was made by the Marion Steam Shovel Co., and powered with General Electric equipment.

Although the dipper capacity is rated 15 cubic yards, it is estimated that the dipper will hold 20 cubic yards, heaping measure. One scoop-load of dirt would be sufficient to fill a trench a foot wide, six feet deep and 68 feet long, or a room 7 by 7 by 8 feet—about the size of the bathroom in an ordinary home.

The reach of the dipper is sufficient to place material about 85 feet above the ground. The dipper has a pushing and lifting power of around 100 tons, which would easily be sufficient to lift an ordinary railroad car full of coal.

As speed of operation is essential, it is necessary that the shovel operate quickly. It takes a bite, dumps it, and is back for another bite in less than a minute. The dipper, when moving around to dump at full speed, travels at the rate of about 20 miles an hour.

The complete shovel weighs approximately 1,600 tons. This is about twice as heavy as the largest shovel previously made. The deck of the shovel on which the electric machinery is mounted is about 20 feet above the ground, and measures 60 feet long and 30 feet wide, or 1,800 square feet. The highest point on the shovel is about 110 feet above the ground.

The electric equipment on the shovel aggregates the equivalent of approximately 4,500 horsepower, but all the operations are controlled by one man. The control is of the variable voltage type, by means of which the generator voltage is varied by varying the generator field. This allows rapid maneuvering and quick reversing, and also limits the torque to a definite safe value so that mechanical parts will not be subjected to undue strains or stresses.

The power supply is alternating current at 4,000 volts. This drives a 5-unit motor-generator set consisting of a motor, three generators and an exciter. The motor, which drives the other four units, is a 1,700-horsepower, 4,000-volt, 720-r.p.m. synchronous unit. One 860-kilowatt generator supplies direct current up to 800 volts for operating the hoist motors; two 350-kilowatt generators supply direct current up to 1,000 volts for operating the swing and crowd motors and a 50-kilowatt exciter supplies 125 volts, direct current, to excite the fields of all the motors and generators.

The hoisting motion is provided by two 450-horsepower, variable-voltage, heavy-duty, steel mill type motors operating at speeds up to a maximum of 500 r.p.m., the speed being variable to suit the nature of the work performed. Two 150-horsepower variable voltage motors of the same type, with a maximum rated speed of 1,000 r.p.m., provide the swing motion, these also having variable speeds.

Science News-Letter, January 18, 1930

Ivory Tools Indicate Alaskan Culture—*Continued*

main routes they followed were doubtless those along the coasts.

Some of the aboriginal immigrants invaded also the interior of the continent by way of the Yukon and other rivers. In an effort to retrace these paths, Dr. Hrdlicka, accompanied by Dr. George Maly of the Charles University of Prague, Czecho-Slovakia, last summer made an additional journey to Alaska. A part of this was rather adventurous. For over 1500 miles the travel was in an open 18-foot craft. It was a journey in almost continuous daylight but through fog and frequent rains and storms. The results were many hundreds of measurements, photographs, casts and specimens.

One of the main facts ascertained definitely on this journey by Dr. Hrdlicka is that there is no line of demarkation, either physical or cultural, between the Indian and the Eskimo along the Yukon. Both shade into each other. The true Yukon Indian, he says, seems like an Indian evolving into an Eskimo, and the Yukon Eskimo like an Eskimo evolving into an Indian.

The skeletal remains collected tell an interesting story of the migrations and perhaps evolution of the later people of the Far North but shed no light on the very ancient culture or on the earlier migrations. The possibility of finding really ancient remains is very remote, Dr. Hrdlicka says, because of the changing coasts and banks of the rivers along which the people traveled. Only a rare accident would reveal graveyards thousands, or even hundreds of years old, in the rocky foothills or the jungle flats of the present stream.

Along the lower Yukon the scientists found a culture that was marked by a profusion of stone implements and artifacts of bone and antler, but essentially Eskimo. In the middle area the variety of implements decreases but two new types make their appearance, showing the shading off into Indian culture. These are bilateral stone axes and tomahawks. Pottery was of the same poor quality along the whole river, with little difference in form.

Dr. Hrdlicka was able to get on friendly relations with the natives by giving medical treatment, explaining frankly his purposes, dealing with them as he would with his own people, and by paying for all the specimens brought in. In this way he has left behind him not a few interested amateur archaeologists with some understanding of his objects.

Making casts of the heads of the living, essential for museum purposes as well as for comparative study, was a little more difficult. Some demanded pay for submitting to the process of "making stone faces." Others were pleased at the prospect of "having their faces in Washington." The greatest difficulty of all, Dr. Hrdlicka said, was to get normal, full-blooded natives. These are becoming scarce along the river, especially in the middle regions where the transition is most marked, and in a few years will have disappeared altogether leaving only a mixed blood population.

The earliest skeletal material recovered, Dr. Hrdlicka said, extends well back before the coming of the Russians, but not from as far back, probably, as the fossil ivory culture. The skeletal material recovered from the Indian areas indicates that the people were true Indians, but with some strongly marked Asiatic affinities. They belong for the most part to one physical type, although there may have been a small group which departed from this.

The living natives along the great waterway afford few clues to the ancient dead, their pioneer ancestors in this far northern land. These are likely to remain for years an inspiration to the imagination of the archaeologists. The existence of the high and rich fossil ivory culture, says Dr. Hrdlicka, is one more conclusive blow at the contentions of the still sometimes encountered opinions that men originated in America, or came from some mythical " lost Atlantis," or crossed the southern Pacific in their frail canoes. Here, he says, is an obvious proof of migrations into the New World of Asiatic peoples.

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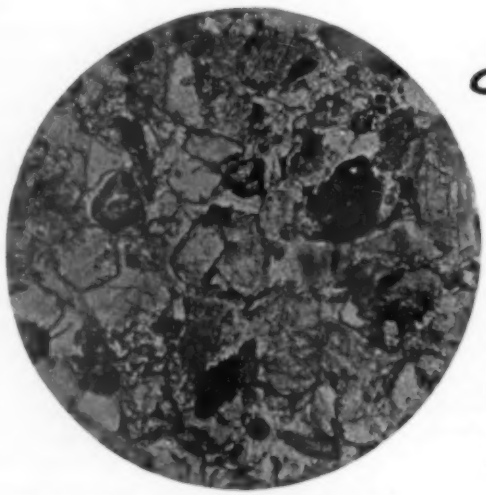

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Physics

ON THE ELEVATION OF THE ELECTRICALLY-CONDUCTING STRATA OF THE EARTH'S ATMOSPHERE. By A. E. Kennelly. In the Electrical World and Engineer, New York, March 15, 1902.

ACCORDING to the measurements of Professor J. J. Thomson (Recent Researches in Electricity and Magnetism, p. 101) air at a pressure of 1-100 mm. of mercury has a conductivity for alternating currents approximately equal to that of a 25 per cent. aqueous solution of sulphuric acid. The latter is known to be roughly 1 ohm-per-centimeter, so that a centimeter cube would have a resistance of about one ohm. Consequently, air at ordinary temperatures, and at a rarefaction 76,000 times greater than that at sea level, has a conductivity some 20 times greater than that of ocean water, although about 600,000 times less than that of copper.

If we apply the ordinary formula for finding the elevation corresponding to a given air-refraction, we find that if the air had a uniform temperature of 0 deg. C., the height of this stratum of air with a rarefaction of 76,000, would be

18.39 log 76,000 kilometers above the sea,

or 89.77 kilometers,

or 55.77 miles.

If the air had a uniform temperature of -50 degs. C., this elevation would be reduced 18.3 per cent., or to 73.3 kilometers (45.5 miles). The temperature of the earth's atmosphere has only been measured within a range of a very few kilometers above the surface of the sea, and consequently the materials are not at hand for any precise calculation of the height of electrically conducting strata. It may be safe to infer, however, that at an elevation of about 80 kilometers, or 50 miles, a rarefaction exists which, at ordinary temperatures, accompanies a conductivity to low-frequency alternating currents about 20 times as great as that of ocean water.

There is well-known evidence that the waves of wireless telegraphy, propagated through the ether and atmosphere over the surface of the ocean, are reflected by that electrically-conducting surface. On waves that are transmitted but a few miles the upper conducting strata of the atmosphere may have but little influence. On waves that are transmitted, however, to distances that are large by comparison with 50 miles, it seems likely that the waves may also find an upper reflecting surface in the conducting rarefied strata of the air. It seems reasonable to infer that electro-magnetic disturbances emitted from a wireless sending antenna spread horizontally outwards, and also upwards, until the conducting strata of the atmosphere are encountered, after which the waves will move horizontally outwards in a 50-mile layer between the electrically-reflecting surface of the ocean beneath, and an electrically-reflecting surface, or successive series of surfaces, in the rarefied air above.

If this reasoning is correct, the curvature of the earth plays no significant part in the phenomena, and beyond a radius of, say, 100 miles from the transmitter, the waves are propagated with uniform attenuation cylindrically, as though in two-dimensional space. The problem of long-distance wireless wave transmission would then be reduced to the relatively simple condition of propagation in a plane, beyond a certain radius from the transmitting station. Outside this radius the voluminal energy of the waves would diminish in simple proportion to the distance, neglecting absorption losses at the upper and lower reflecting surfaces, so that at twice the distance the energy per square meter of wave front would be halved. In the absence of such an upper reflecting surface, the attenuation would be considerably greater. As soon as long-distance wireless waves come under the sway of accurate measurement, we may hope to find, from the observed attenuations, data for computing the electrical conditions of the upper atmosphere. If the attenuation is found to be nearly in simple proportion to the distance, it would seem that the existence of the upper reflecting surface could be regarded as demonstrated.

When Marconi, in Newfoundland, received the three dots of the letter S by means of an antenna held aloft a la Franklin, by a kite, he furnished Prof. Kennelly with data for his inference as to the existence of an ionized layer or layers in the earth's atmosphere. For the . . . were sent from a pioneer transatlantic radio station in Cornwall, England, and computation showed that the amount of energy radiated from England was too small to operate the receiver across the ocean, if the waves travelled directly over the water, or through the air, according to the ordinary three-dimensional expansion hypothesis of electromagnetic distribution. That was in the fall of 1901. Prof. Kennelly's explanation was published early in 1902.

At first the ionized layer of the earth's atmosphere was called the "Heaviside layer" due to fact that the English gave credit to Dr. Oliver Heaviside, English physicist, for the origin of the theory. In fact, Prof. Kennelly himself presumed that Dr. Heaviside's Encyclopedia Britannica article, reprinted in part on this page, was published earlier than his own explanation, but in 1923 he was prompted to look into the matter of priority, through a hint in a French comment that his was the prior publication.

The result was the rechristening of the ionized layer as the "Kennelly-Heaviside layer."

TELEGRAPHY. By Oliver Heaviside. In Encyclopedia Britannica, Vol. XXXIII, 1902 (*Published Dec.* 19, 1902, *written June,* 1902).

THERE is something similar in "wireless" telegraphy. Sea water, though transparent to light, has quite enough conductivity to make it behave as a conductor for Hertzian waves, and the same is true in a more imperfect manner of the earth. Hence the waves accommodate themselves to the surface of the sea, in the same way as waves follow wires. The irregularities make confusion, no doubt, but the main waves are pulled round by the curvature of the earth, and do not jump off. There is another consideration. There may possibly be a sufficiently conducting layer in the upper air. If so, the waves, so to speak, catch on to it more or less. Then the guidance will be by the sea on one side and the upper layer on the other. But obstructions, on land especially, may not be conducting enough to make waves go round them fairly. Then waves will go partly through them.

THE KENNELLY-HEAVISIDE LAYER. A letter by Alexander Russell to Nature, October 24, 1925.

EVERY radio engineer is familiar with what is called the "Heaviside Layer" and (*Turn to next page*)

Crime Wave Spreads to Wild Animals

Zoology

The much-talked-of crime wave seems to have spread even to some of the wild animals of Yosemite National Park, and it has been necessary to provide a patrol wagon especially adapted to the peculiar need to take care of recalcitrant bears.

The patrol wagon is unique, consisting of a piece of corrugated pipe large enough to contain a bear, sealed at one end and equipped with a trap door at the other. It is mounted on pneumatic wheels to make the riding easy and attached to an automobile truck.

When word is received at headquarters that a bear is disturbing the peace anywhere in the park, the patrol is quickly sent to the scene of trouble. Since bears live solitary lives, each holding sway over certain areas, the disturber is likely to be the only bear in his particular neighborhood. The pipe bear trap on wheels is then detached and a piece of meat placed inside.

This guilty bear, smelling the meat, usually crowds into the pipe in search of it. The trap door slams shut and the bruin is a prisoner.

Bears so caught in the inhabited portion of Yosemite Valley are sentenced to banishment. They are marked with a daub of paint for purposes of later identification, taken to the lower end of the park and released. If they "repeat" they are identified by the paint mark.

Yellowstone Park's "holdup bears" have developed a new branch of the desperado business. One of them recently robbed the United States mails. Park Naturalist Dorr Yeager tells of the occurrence, which befell one of his colleagues, Dick White:

"It seems that some time ago Dick stopped at the West Thumb road camp for lunch. The season being closed, and the regular mail delivery having ceased, Dick was obligingly carrying a bundle of mail with him for the members of the different road crews around the loop. He left the mail in the car and, after enjoying a good meal, returned to continue his journey to Lake.

"Imagine his surprise, however, to find the package of mail not in the car but between the paws of a black bear in a nearby tree. Bruin was examining the packet intently, sniffing and turning it over in an inquisitive manner."

Science News-Letter, January 18, 1930

Adults Need Vitamin D

Physiology

That the present-day craving for sun-tan safeguards health as well as social standing has been further demonstrated by two Chicago scientists, Dr. Katharine Blunt and Miss Ruth Cowan, who are about to publish a book on the subject of ultraviolet light and vitamin D.

If adults are deprived seriously of these two factors, they run the risk of osteomalacia, a famine disease in which the bones lose calcium, soften, and change in shape. Bow legs, carious teeth and peculiar gait develop in these people. If they played golf, swam outdoors, or even walked to work the condition could be averted. But in these days of scientific wonders other methods of prevention and cure have been discovered, such as ultraviolet light therapy, cod-liver oil, and irradiated foods. It is this light which is so important, and a person can either irradiate himself or purchase irradiated food.

In certain sections of India, among the women of the better class, osteomalacia is common because they are kept indoors most of the time and are heavily veiled when they do go out. The ultraviolet light never reaches them. Women of the lower class who are out all day in the open air are entirely free from the disease.

Ultraviolet light is the key to the situation in the prevention or relief of this condition among adults, but it cannot accomplish prevention or relief entirely by itself, because other factors enter in. While vitamin D is important, a supply of calcium is also necessary for bones to grow properly and to remain strong and healthy throughout life. Sunshine and cod-liver oil are good sources of vitamin D and calcium is to be found in milk, primarily, and also in fresh fruits and vegetables.

Science News-Letter, January 18, 1930

Kennelly-Heaviside—*Cont.*

its supposed functions. I find, however, that the hypothesis of an electrically conducting stratum in the upper air was clearly enunciated in an article by Prof. A. E. Kennelly, of Harvard University, published in the *Electrical World and Engineer* of New York on March 15, 1902. The official date of Heaviside's disclosure of his hypothesis is December 19, 1902. About the same date H. Poincaré, A. Blondel, and C. E. Guillaume made similar hypotheses. If names are to be attached to this hypothetical layer it should be called, in equity, the "Kennelly-Heaviside" layer, a name which is beginning to be used in America.

Science News-Letter, January 18, 1930

Parrot Fever—*Cont'd*

break. A special study of the parrot fever epidemic in this country is now being made by Dr. Charles Armstrong, of the U. S. Hygienic Laboratory in cooperation with the health officers of the various states and cities where cases have been reported.

Dr. Armstrong was detailed to this special work as a result of a meeting of the staff of the U. S. Public Health Service, called especially to consider the present situation in regard to psittacosis.

Science News-Letter, January 18, 1930

One Cincinnati court has been equipped with a microphone and loudspeaker, so that jurors may be sure to catch all that is said by the witnesses.

Bibliography

of the Writings of

Edwin E. Slosson

A complete list of articles and addresses giving titles and references, which are obtainable in almost any library

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NATURE RAMBLINGS

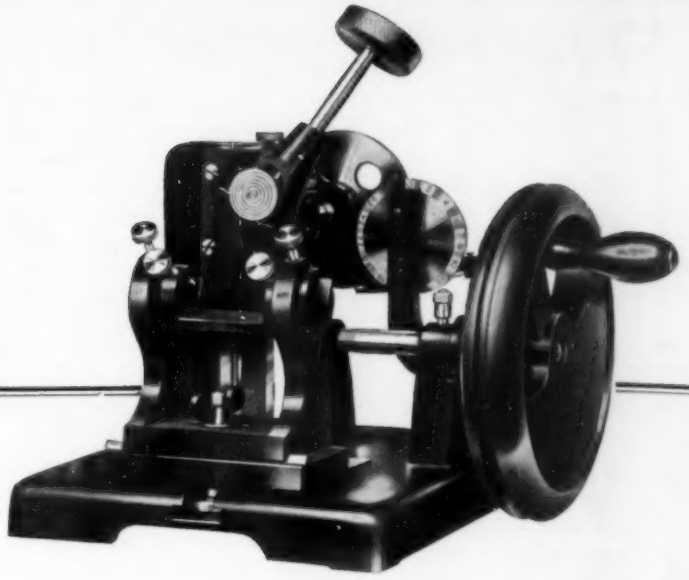
By Frank Thone

White Pine

Among the noblest of our winter evergreens is the white pine, distinguishable from all other common pines by the dark, smooth bark on its upper trunk and branches, even where these are of considerable size, and especially by the fact that its long, fine, soft needles are invariably found in bunches of five. The trees of the yellow-pine group have coarser, stiffer needles in groups of from two to four, usually two, but with one unimportant exception on the Pacific coast, the yellow-pine needles are never in fives.

A past generation built very largely in white pine—"soft pine" they called it then. Now it is scarce and very expensive, and most of it comes from the Pacific Northwest, where there are still some great white pine forests, though these are being devoured by ax and saw as were those of Minnesota and Michigan and Maine in the good old days when people thought that American forests could never be exhausted.

In the East, a new generation, warned of the prospective desperate shortage of this most desirable softwood, has been setting out plantations of white pine, and caring solicitously for the patches of original timber that are left. But by a tragic irony, just as the loss by waste was being ended, greater loss by plague has come in. For the white pine of the central and eastern states is threatened with extinction by a terrible plant disease, the white pine blister rust. It has been discovered that this disease depends on currants and gooseberries for a part of its life, and both wild and cultivated bushes of these berries are being wiped out in the campaign to save the white pine trees.



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An improved Minot Rotary Microtome is offered by the Bausch & Lomb Optical Company. Upon the suggestion of Dr. Howard T. Karsner of the School of Medicine of Western Reserve University, the best features of the Standard Rotary Microtome, as sponsored by the late Dr. Charles S. Minot of Harvard University, and the best features of this type of microtome formerly made by the International Instrument Company have been combined to form one microtome of unusual features.

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FIRST GLANCES AT NEW BOOKS

AN HOUR WITH THE MOVIES AND THE TALKIES—Gilbert Seldes—*Lippincott* ($1). A stimulating discussion of a popular subject by an eminent critic, in which the author concludes: "The movie industry may fall or may re-form itself into a talkie industry; but the movie itself, with or without the talkie a part of its power and beauty, will persist."

Motion Pictures
Science News-Letter, January 18, 1930

A HISTORY OF EGYPT FROM THE EARLIEST TIMES TO THE END OF THE EIGHTEENTH DYNASTY (Two Volumes)—James Baikie—*Macmillan* ($10.50). Egypt's cultural record and the careers of her kings and queens, viziers and architects can be entertaining as well as enlightening when told skilfully as in these volumes. The first volume opens with the land of Egypt and the beginnings of life there, and traces the evolution of the powerful, glittering civilization through 3,000 years. The second volume devotes equal space to 300 significant years of the eighteenth dynasty, the age of Queen Hatshepsut, of Akhenaten, and the boy Tutankhamen.

History
Science News-Letter, January 18, 1930

THE ILLUSTRATED MEDICAL DICTIONARY—W. A. N. Dorland—*Saunders* ($7). The fifteenth edition of this standard work follows the custom of its predecessors by making a special feature of new words and terms, of which several thousand have been added. Another feature is the establishment of a definite standard in terminology, spelling, hyphenization, capitalization, etc. The editorial staff of the American Medical Association has re-edited the entire book.

Medicine
Science News-Letter, January 18, 1930

ETHNOGRAPHY—Loomis Havenmeyer—*Ginn* ($4.80). Different branches of the human family set down in different parts of the earth have devised or improved for their own use customs, inventions, art, language. This book shows the student twenty groups, representing varying cultural developments in the four great races. The need for a basic text and reference book of this sort has been apparent, and Dr. Havenmeyer's well-arranged volume fills the gap admirably. There are many illustrations and some useful maps.

Ethnology
Science News-Letter, January 18, 1930

INTRODUCTION TO THE THEORY OF NUMBERS—Leonard Eugene Dickson—*University of Chicago Press* ($3). In this book a leading mathematician has produced a work that will serve to introduce many students to a subject that has long engaged the attention of professional and amateur mathematicians. College algebra is the only prerequisite, except for one chapter on Diophantine equations.

Mathematics
Science News-Letter, January 18, 1930

THE ROCKEFELLER FOUNDATION ANNUAL REPORT—The bulk of the report surveys the work of the international Health Division of the Foundation. This part will be of particular interest to public health officers and nurses and the various unofficial agencies engaged in health work. There is also a section devoted to the Foundation's Division of Medical Education.

Medicine
Science News-Letter, January 18, 1930

PROTECTION OF ELECTRICAL CIRCUITS AND EQUIPMENT AGAINST LIGHTNING—*Government Printing Office* (25c). In this Bureau of Standards publication is found a complete discussion of an important phase of electrical engineering, that of protection from lightning damage.

Electrical Engineering
Science News-Letter, January 18, 1930

VITAMINS IN FOOD MATERIALS—Sybil L. Smith—*Government Printing Office* (15c). This report of the U. S. Department of Agriculture will be valuable to home economists and nutritionists because of the concise form in which is given the relative vitamin distribution in foods and because of the selected bibliography of literature referring to vitamin occurrence and technic of vitamin determination.

Dietetics
Science News-Letter, January 18, 1930

REPORT OF THE CONFERENCE ON MIDWESTERN ARCHAEOLOGY HELD IN ST. LOUIS, MO., MAY 18, 1929—*National Research Council* ($1.25). This important meeting to promote the conservation, study, and public use of prehistoric sites of the Mississippi region brought together many specialists on prehistoric America. The papers on Indian mounds and Mound Builders which they read at the meeting and the discussions which followed, are published in this report.

Archæology
Science News-Letter, January 18, 1930

THE CONQUEST OF THOUGHT BY INVENTION—H. Stafford Hatfield—*Norton* ($1). A little book in the "New Science Series". The author foresees the time a few centuries hence when the lives of our descendants will have become completely mechanized, but he believes that, as a psychological compensation, private life will revert to the simplicity of the savage, without its hardships.

Sociology
Science News-Letter, January 18, 1930

INVESTMENTS OF UNITED STATES CAPITAL IN LATIN AMERICA—Max Winkler—*World Peace Foundation* ($2). Those interested in the utilization of the resources of America's southern neighbors will find this volume in a handbook to financial alignments in Latin America.

Economics—Political Science
Science News-Letter, January 18, 1930

INEDIBLE ANIMAL FATS IN THE UNITED STATES—L. B. Zapoleon—*Food Research Institute* ($4). At first glance it may seem inappropriate that the Food Research Institute at Stanford should issue this comprehensive study of the economics of the production of inedible fat in the meat packing and the rendering industry. The reason is that, although advertisements do not stress the fact, almost any fat or grease can be rendered edible by modern refining methods. There is the greatest inter-relation, economically speaking, between the production of edible and inedible fats.

Economics—Chemistry
Science News-Letter, January 18, 1930

THE WAY OF THE SEA—Harold Peake and Herbert John Fleure—*Yale Univ. Press* ($2). The sixth volume in the series of eight entitled "The Corridors of Time," in which the development of civilization is traced. This book deals with the period of from 2100 to 1600 B. C., and shows effects of broader travel and trade throughout the Old World.

Archæology—Ethnology
Science News-Letter, January 18, 1930

ENVIRONMENT OF THREE-YEAR-OLD CHILDREN—Dorothy Van Alstyne—*Teachers College, Columbia Univ.* ($1.50). A statistical study of relationships between the quality of home surroundings and the intelligence scores achieved by children three years of age.

Psychology
Science News-Letter, January 18, 1930